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H. KAMEMOTO, G. J. WILFRET, and M. ARAGAKI

HAWAII AGRICULTURAL EXPERIMENT STATION, UNIVERSITY OF HAWAII

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COLLEGE OF TROPICAL AGRICULTURE
UNIVERSITY OF HAWAII
Honolulu, Hawaii

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In 1951 a trial of 35 chrysanthemum cultivars was conducted at the University of Hawaii (Kamemoto and Nakasone, 1952). Since that time considerable changes in the availability of cultivars as well as methods of cultivation have occurred. Practically every commercial grower today controls flowering through the use of artificial lights, whereas in 1951 artificial lighting was rarely practiced. In view of these changes a chrysanthemum cultivar trial was conducted under field conditions with particular emphasis on early flowering spray types which might produce two good successive crops from the same planting.

PLANT MATERIALS AND PROCEDURE

Fifty rooted cuttings each of 40 cultivars were received from Yoder Brothers of California, Inc., on September 7, 1966. These represented 12 white spray types, 12 yellow spray types, 11 red, bronze and pink spray types, and 5 standards. The cuttings were planted directly in beds previously fumigated with methyl bromide at 1.5 lbs./100 sq. ft.

Each cultivar was planted in two plots, each of which consisted of 24 plants spaced 8 inches within the row and 10 inches between rows. All plants were pinched two weeks after planting. They were fertilized with 14-14-14 fertilizer soon after transplanting and again a month later, irrigated every other day, and sprayed bi-weekly with malathion and Dithane Z-78. Standards were disbudded.

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* Dr. H. Kamemoto is Professor of Horticulture at the University of Hawaii and Horticulturist at the Hawaii Agricultural Experiment Station; G. J. Wilfret is Graduate Assistant in the Department of Horticulture; and Dr. M. Aragaki is Associate Plant Pathologist at the Hawaii Agricultural Experiment Station.

Artificial lights were provided from the date of planting until October 20 each night from 10 p.m. to 2 a.m. with 100-watt Mazda lamps mounted with reflectors 5½ feet from the ground. As the cultivars flowered, they were harvested and pertinent data were recorded. Immediately following harvest in late December, lights were again provided until March 8, 1967, to promote vegetative growth. New growth had been cut back once on February 8. The ratoon crop flowered in early May.

RESULTS AND DISCUSSION

Most cultivars grew remarkably well under favorable growing conditions. Generally 4 to 5 breaks were obtained after pinching, and stems ultimately attained lengths of up to 36 inches despite only 4 weeks of long day conditions following pinching. Yields for the first crop were relatively high. Many cultivars yielded more than 15 pounds from the 24 plant plots.

The second or ratoon crop in the spring was generally poorer than the first crop. Stems were shorter and yields lower. Considerable variations in ability to produce vegetative regrowth were evident among cultivars. Unlike the fall of 1966, the spring of 1967 was unfavorable for outdoor chrysanthemum culture due to extremely wet conditions. Incidence of *Stemphylium* leaf spot was high, which greatly affected growth.

Weeks to Flower

The number of weeks required from bud initiation to flowering is an important horticultural consideration, especially under outdoor conditions where winds, rain, insects, and diseases may greatly affect the crop. Obviously, the shorter the time from bud initiation to flowering, the better the chances for successful cropping. Thus, the cultivars selected for this trial were those requiring 10 weeks or less for flowering.

Practically all cultivars required ½ week to 1½ weeks less time for flowering than on the mainland. For example, the Chip cultivars, listed as 9-week cultivars, required 8 to 8½ weeks to flowering. Huntsman, listed as a 7-week cultivar, required only 6 weeks. Iceberg, a 10-week cultivar, required only 8½ weeks in the fall and 8 weeks in the spring to flower. The warmer climate of Honolulu is probably responsible for the more rapid development of flower buds.

The spring crop came into flower about ½ week sooner than the fall crop. This information may be of some value in timing flowering for December and early May.

Stemphylium Leaf Spot

The fall crop was relatively free of insects and diseases because of good weather and regularity of spray applications. However, high rainfall during the spring months resulted in the outbreak of *Stemphylium floridanum* leaf-spot disease. This outbreak afforded an excellent opportunity to evaluate the degree of resistance of the cultivars to *Stemphylium* leaf spot.

The highly resistant cultivars appeared to be BGA Show Off, Charles Nye, Huntsman, and Memento. Those rated resistant were BGA Flair, Buckskin, Gold Coast, Good News, Happiness, Indianapolis White, Thunderbolt, White Keepsake, and Yellow Keepsake. The Chip cultivars were susceptible, exhibiting brown, spreading lesions in young leaves and blights on older leaves.

White Spray Type

Cultivars with fine performance were Horizon, BGA Cloudbank, Memento, and Iceberg. Horizon was the earliest cultivar, requiring only 6 to 7 weeks from bud initiation to flowering. Stems were erect, and the fall and the spring crops were equally productive. BGA Cloudbank flowered in 7 to 7½ weeks. This attractive white anemone type gave heavy yields. Foliage was green and resistant to *Stemphylium.* Memento, an 8-week daisy type, exhibited outstanding resistance to *Stemphylium.* Stems were sturdy, foliage green, and yields were equally good. Iceberg was a vigorous grower, and produced attractive large pompon flowers on erect, sturdy stems.

Exceptionally poor performers were Pristine and BGA Thunderbolt which produced yellow leaves and weak growth, and #2 Whitechip which gave very low yields. White Keepsake, along with Yellow Keepsake, #2 Whitechip and Yellowchip produced deformed leaves in their young growth but eventually grew out of this condition.

Yellow Spray Type

Best performance was obtained from Yellow Calumet, BGA Topflight, and Golden Herald. Yellow Calumet flowered in only 6 to 6½ weeks. This attractive pompon showed similar behavior in both fall and spring crops. Stems were erect and yields satisfactory. BGA Topflight required 6½ to 7 weeks for flowering. Flowers were of the attractive anemone type, growth was uniform, and yields were satisfactory. Golden Herald is a large-flowered, attractive decorative with a tall habit and erect, sturdy stems.

Like Whitechip, Yellowchip gave very poor yield.

Bronze, Pink and Red Spray Types

This group of cultivars showed greater variability between fall and spring crops than whites and yellows. Fading of flowers was common. Huntsman, which required only 6 weeks from initiation to flowering, was rated fair for the fall crop and excellent for the spring crop. This reddish-bronze decorative showed excellent growth and coloring in spring. Yields of both crops were high and the cultivar appeared to be highly resistant to *Stemphylium.* BGA Show Off, an amber-colored, attractive decorative, had erect, sturdy stems and satisfactory yields. Accolade, with its attractive, large, pink flowers and erect stems, showed promise.

Bluechip was outstanding among the Chip cultivars including Copperchip, Rosechip, Whitechip, and Yellowchip. Yield of the fall crop was exceptionally high and that of the ratoon was satisfactory. Flowers were attractive, and stems were sturdy and erect. The foliage of the spring crop was severely damaged by *Stemphylium,* indicating its susceptibility to the disease.

Standards

Only 5 cultivars were included in the test since standards are generally not adapted to outdoor cultivation. Albatross, one of the popular West Coast varieties, flowered earliest, but quality was poor. The outer petals were easily injured by the hot sun. Yellow Moon gave relatively poor yields. Stems were long and weak and petals shattered easily. Good News and Indianapolis White performed reasonably well in both crops as has been witnessed during the past several years of trial.

The outstanding standard in this group was Butterball, which flowered in 7 to 8 weeks. Yields for both crops were exceptional. Stems were sturdy and erect, and flowers were attractive and unblemished. It appears to have great promise for outdoor cultivation.

SUMMARY

An evaluation trial of 40 chrysanthemum cultivars received from Yoder Brothers of California, Inc., was conducted in 1966-1967 at the Horticulture Farm of the University of Hawaii. Particular emphasis was placed on the performance of two successive crops of 6- to 10-week spray types under field conditions.

Cultivars generally flowered in ½ week to 1½ weeks less time from bud initiation to flowering than on the mainland. The following performed well:

White spray–Horizon, BGA Cloudbank, Memento, Iceberg.

Yellow spray–Yellow Calumet, BGA Topflight, Golden Herald.

Bronze, pink and red spray–Huntsman, Accolade, Bluechip.

Standards–Butterball, Good News, Indianapolis White.

LITERATURE CITED

Kamemoto, H., and H. Y. Nakasone. 1952. 1951 Chrysanthemum Variety Trial. University of Hawaii Agr. Exp. Sta. Progress Notes 79. 8 pp.

Table 1. Performance and evaluation

Cultivar	Weeks to flower 1st crop	Weeks to flower 2nd crop	Flower type	Flower diameter (in.)	Stem length (in.) 1st crop	Stem length (in.) 2nd crop
Horizon	7	6	Pompon	2	25	25
Pristine	7½	7	Pompon	2¼	31	25
White Popcorn	8½	7½	Pompon	2	29	23
White Keepsake	8	7½	Pompon	2	31	28
BGA Cloudbank	7½	7	Anemone	3¼	35	29
BGA Alabaster	7½	8	Daisy	3	34	29
BGA Tinsel	7	7	Feather	2¼	32	28
Memento	8	8	Daisy	2½	35	26
#2 Whitechip	8	8	Decorative	2½	30	25
BGA Thunderbolt	8	8	Anemone	2¾	28	19
Thistledown	8½	8	Feather	2	30	26
Iceberg	8½	8	Pompon	2½	34	29

of white spray chrysanthemum cultivars

Plot yield (lb.)		Resistance to	Rating		
1st crop	2nd crop	Stemphylium	1st crop	2nd crop	Remarks
14	13	Intermediate	Good	Good	Straight stem, good yield.
10	7	Susceptible	Poor	Very poor	Yellow leaves, weak growth.
19	11	Intermediate	Fair	Good	Sturdy stems, good yield.
14	11	Resistant	Fair	Good	Tall, erect stems; creamish flowers.
19	14	Resistant	Fair	Good	Attractive flowers, green leaves.
18	15	Intermediate	Poor	Fair	Crooked stem, unattractive.
16	14	Intermediate	Fair	Excellent	Slender stems, good yield, attractive.
14	13	Resistant	Fair	Good	Erect, sturdy stems; green leaves.
9	4	Intermediate	Poor	Very poor	Poor yield, pink-tinged.
8	5	Resistant	Very poor	Very poor	Weak stem, yellow foliage, poor yield.
10	8	Susceptible	Good	Fair	Slender stems, lavender centers.
20	16	Susceptible	Good	Excellent	Erect, sturdy stems; attractive flowers.

Table 2. Performance and evaluation of

Cultivar	Weeks to flower		Flower type	Flower diameter (in.)	Stem length (in.)	
	1st crop	2nd crop			1st crop	2nd crop
John Milbrath	8	7½	Pompon	2½	23	22
Chas. Nye	8	7	Pompon	2	24	28
Yellow Calumet	6½	6	Pompon	2¼	24	23
BGA Topflight	7	6½	Anemone	1¾	25	22
Gold Coast	8	8	Pompon	1¾	27	22
BGA Yellow Alabaster	8	7½	Daisy	3	36	32
Yellow Keepsake	8½	8	Pompon	2	30	26
Golden Herald	8	8	Decorative	3	38	33
Happiness	7½	7	Decorative	3	34	29
BGA Sunbeam	8½	8	Daisy	3	37	28
BGA Flair	8	7	Daisy	2¾	27	24
Yellowchip	8½	8	Decorative	2½	32	30

yellow spray chrysanthemum cultivars

Plot yield (lb.)		Resistance to	Rating		
1st crop	2nd crop	Stemphylium	1st crop	2nd crop	Remarks
12	7	Susceptible	Fair	Fair	Large, attractive flowers; poor ratoon.
15	9	Resistant	Fair	Poor	Weak stems, poor ratoon.
12	14	Intermediate	Good	Good	Attractive, very early.
14	9	Intermediate	Good	Good	Good yield, attractive early.
15	9	Resistant	Good	Fair	Erect stem, attractive.
17	15	Intermediate	Fair	Poor	Long, crooked stem; unattractive.
10	12	Resistant	Fair	Good	Distorted growth, sturdy stems.
14	13	Intermediate	Good	Excellent	Erect, sturdy stems, attractive.
18	15	Resistant	Fair	Good	Uniform, strong growth.
17	11	Intermediate	Poor	Fair	Crooked stem.
16	10	Resistant	Fair	Fair	Unattractive.
10	5	Susceptible	Fair	Very poor	Poor yield.

Table 3. Performance and evaluation of bronze,

Cultivar	Weeks to flower 1st crop	Weeks to flower 2nd crop	Flower type	Flower diameter (in.)	Stem length (in.) 1st crop	Stem length (in.) 2nd crop
Huntsman	6	6	Decorative	2¼	28	23
Dark Calumet	7	6½	Pompon	2	27	22
Rajah	7½	7	Daisy	2¼	29	24
Resolute	8	8	Pompon	2½	26	20
Buckskin	8	7½	Daisy	2	30	22
BGA Show Off	8	8	Decorative	2½	32	31
Copperchip	8	8	Decorative	2½	33	30
Accolade	8	7	Decorative	3¾	35	25
BGA Pink Marble	8	8	Decorative	3	37	27
Bluechip	8	8	Decorative	2½	34	27
Rosechip	8½	8	Decorative	2½	37	28

Table 4. Performance and evaluation of

Cultivar	Weeks to flower 1st crop	Weeks to flower 2nd crop	Flower color	Flower diameter (in.)	Stem length (in.) 1st crop	Stem length (in.) 2nd crop
Yellow Moon	8	7	Yellow	5	31	28
Butterball	8	7	Yellow	4½	29	23
Good News	8½	8	Yellow	4¾	29	23
Ind. White	8	8	White	5	27	18
Albatross	7½	7	White	4¾	26	18

red and pink spray chrysanthemum cultivars

Plot yield (lb.)		Resistance to	Rating		
1st crop	2nd crop	Stemphylium	1st crop	2nd crop	Remarks
16	13	Resistant	Fair	Excellent	Good growth, excellent red color in spring.
14	10	Intermediate	Good	Fair	Fading of bronze color.
12	8	Intermediate	Excellent	Fair	Variable performance.
16	7	Intermediate	Good	Fair	Poor regrowth, faded bronze.
15	7	Resistant	Fair	Fair	Poor ratoon crop.
13	9	Resistant	Good	Good	Erect, sturdy stems; attractive flowers.
14	5	Intermediate	Good	Poor	Poor yield, attractive flowers.
19	9	Intermediate	Good	Good	Erect, sturdy stems; attractive flowers.
13	7	Intermediate	Fair	Fair	Long stems, fair regrowth.
18	12	Susceptible	Excellent	Good	Erect, sturdy stems; good yield, attractive flowers.
16	10	Susceptible	Good	Fair	Attractive flowers, fair regrowth.

standard chrysanthemum cultivars

Plot yield (lb.)		Resistance to	Rating		
1st crop	2nd crop	Stemphylium	1st crop	2nd crop	Remarks
68	45	Intermediate	Poor	Fair	Poor yield, weak stems, petals shatter.
137	130	Intermediate	Excellent	Excellent	Erect, sturdy stems; good yield.
91	80	Resistant	Good	Good	Sturdy growth, attractive flowers.
120	88	Resistant	Excellent	Good	Attractive flowers, short stems in ratoon.
111	101	Intermediate	Fair	Poor	Short stems, damaged outer petals.

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HAWAII AGRICULTURAL EXPERIMENT STATION
HONOLULU, HAWAII
